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SOME DISCUSSION AND EXTENSION OF MANFRED BIERWISCH'S

WORK ON GERMAN ADJECTIVALS

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INTRODUCTION

This article presents some discussion, criticism, and extension of Manfred Bierwisch's recent paper, "Some Semantic Universals of German Adjectivals" (1). Bierwisch draws conclusions about the structure of semantic theory as the result of his attempt to analyze the meaning of selected words and expressions. Correspondingly, the present paper will separate into two parts: (1) an extension of Bierwisch's study of semantic theory, and (2) further analysis of particular expressions. In Part I I will present certain difficulties that arise from Bierwisch's restructuring of semantic theory along with suggestions for dealing with these difficulties. In Part II I will present the analysis of some words and expressions related to those that Bierwisch has examined. My analysis will use many of the semantic markers he has proposed as well as others that I have found necessary to add. These examples are further evidence of the usefulness of the semantic markers Bierwisch introduced.*

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* Of necessity, a thorough understanding of the present paper will require a thorough familiarity with Bierwisch's work on the part of the reader. Furthermore, all my statements will concern semantics in English rather than German. Most of Bierwisch's examples and analyses seem to have close counterparts in English, so many of the claims I will make about English should be equally valid for German. But, in general, I will not examine the question of whether the two languages require different treatment. Some of the examples treated in Part II will be peculiar to English.

PART I

In this first part I will deal with the difficulties posed
by the role Bierwisch assigns to dependency structures in sem-
antic theory. Both Katz (see, for example, Katz and Postal, An
Integrated Theory, Section 2.2) and Bierwisch take the position
that the analysis of an expression's meaning is given by a number
of formal objects called readings of the expression. Each read-
ing represents a specific sense of the expression. The readings
of morphemes are given in a lexicon; the readings of an expression
composed of two or more sub-expressions (morphemes or larger units)
are derived as a compositional function of the sub-expressions'
readings. This process of putting readings together is called
amalgamation of readings and is performed by rules called projec-
tion rules. Readings are composed of primitive ele ᵔnts, that is,
elements which are undefined in the theory, called primitive sem-
antic markers. Readings which are composed of primitive semantic
markers are sometimes referred to as complex or composit semantic
markers. It is generally agreed that a semantic marker will not
be an unordered set of other semantic markers, but will have
structure of some sort (c.f. Bierwisch, pp. 22-23 and references
cited there).

In developing the readings for physical objects and the
associated spatial adjectives, Bierwisch notes that some markers
seem to be naturally subordinate to others in a manner amenable
to representation in a tree structure notation (section 3.3).
This fact leads him to introduce "dependency structures" as the
means of representing the readings and stating the rules governing
amalgamation. A dependency structure, or "dependency tree", is
built up with a single relation, "YdX", read, "X depends on Y".
If Y and Z depend on X no relevance is put on the order of Y and Z
in their X-dependence. Finally, unlike a phrase marker, the terms

which label the nodes of a dependency tree do not divide into terminal and non-terminal symbols. Thus, the terminal symbols are not, as they are in phrase markers, the objects classified by the non-terminal symbols.

The cases which Bierwisch describes by saying the semantic marker X is dependent on the semantic marker Y include more than one conceptual relation between the concepts which those markers represent. In Bierwisch's example of "Schrank" (p. 19) the marker (+rigid) is given as dependent on the marker (physical object). (+rigid) is to be interpreted as further characterizing or specifying the property (physical object) with the property (+rigid). (3 space) depends on (physical object) so as to further characterize it with the property of three dimensionality. However, the markers dominated by (3 space) further characterize (3 space) in terms of different conceptual relations by selectively characterising different parts, namely the three component dimensions represented by (3 space). For example, (+ vert) selectively characterizes one dimension on the basis of its spatial orientation, whereas (+ rigid) indicates a general physical property of the whole object. In general, if X depends on Y, X is understood as further characterizing Y in a way that reflects different conceptual relations. But the formalism of the dependency relation itself does not capture such differences; they are made specific only by the intended interpretations of the markers X and Y. Since the further characterization involved is not made explicit by the dependency relation we lose nothing by generalizing one step further: to say marker X depends on marker Y is just to say that X bears some direct relation to Y, where the relation is specified by the in pretation of X and Y. The effect of representing X as dependent on Y and as not (directly) dependent on another marker, say Z, is to represent X as having a direct relation in its interpretation to Y and not to Z.

A dependency tree in this sense is a very minimal sort of structuring. It can easily be seen that the dependency notation is an alternative and equivalent notation to the bracketing used in previous discussions of semantic theory, as for example in the many examples of structured readings Katz gives in "Recent Issues in Semantic Theory". This correspondence of notations can be indicated by introducing the following convention for representing dependency structures: Markers (B_1), (B_2),...(B_n) listed in a bracket are interpreted as being directly dependent on the marker immediately to the left of the bracket.

Thus (A) $((B_1)$, (B_2),---$(B_n))$ represents the tree

$$
\begin{array}{c}
(A) \\
(B_1)(B_2)----(B_n)
\end{array}
$$
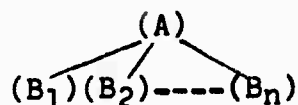
(A), (B_1),--,(B_n) may each be either a primitive or a complex marker. Despite the simplicity, any relation can be indicated, but in both notations at the expense of putting the burden of representing the particular relation on the interpretation of the markers.

Since dependency trees and bracketing are equivalent notations for indicating that there is some direct relation of one marker to another, there is no theoretical issue here any more than there is an issue in the question of whether phrase structure in syntax is to be represented by trees or by bracketing. Thus we may use either dependency structures or bracketing as a means of representing the structure of a complex semantic marker like (physical object). However Bierwisch does create a theoretical issue by attempting to use dependency structures to eliminate selection restrictions from semantic theory. We shall now argue that this application of dependency structures has to be rejected.

THE STATUS OF SELECTION RESTRICTIONS

On Katz's view, the analysis of the meaning of an expression must be broken down into two parts. The first gives the conceptual content or meaning content proper. A second list of markers, the selection restriction, gives the markers that a second expression must have in order to be amalgamated with the first.[*]
In Bierwisch's presentation, dependency structures seem to make this distinction unnecessary. A dependency structure is said to serve both these functions. The same structure which specifies the meaning content of an expression, R, restricts the range of readings with which amalgamation is possible to just those whose structures have a place where the structure R "fits in" in accord with a given list of dependency matching rules. For example, if the dependency structure (A)-(B) is part of the lexical entry for an adjective, then the semantic marker (B) acts as a selection restriction if the adjective modifies a noun with the semantic marker (C) which is antonymous to (B)[**]; and (B) is injected into any dependency structure with which (A)-(B) is compatible (according to Bierwisch's dependency structure matching rules), for example (A)-(G)-(H).

There are several difficulties with this new device. It may be argued that the determination of conceptual content and restriction of combination of concepts are two clearly different characteristics of meaning. Semantic theory ought to make the distinction explicit. Thus we do not usually think it part of the conceptual content of the word "colorful" that it applies to

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[*]For a full description of selection restrictions see, for example, Katz and Postal, An Integrated Theory of Linguistic Descriptions, p. 15.

[**]This involves a dependency satisfaction rule which Bierwisch needs but does not state, to be discussed below.

physical objects but not, say, to emotions. It might be replied
that the distinction can be called into question because many
cases are not as clear as "colorful". For example, verticality
of a principle axis is clearly part of the conceptual content of
"high", and the amalgamation of "high" and "cigarette" is blocked
just because the one principle axis of a cigarette is normally
not vertical*. The conclusion seems to be that amalgamation is
blocked here precisely because the conceptual contents of the two
words are incompatible. An impression of this sort seems to be one
of Bierwisch's motivations for restructuring semantic theory.

Take another example: "elderly idea" is anomalous because
"elderly" is used only of persons. But is it part of the con-
ceptual content of "elderly" to be a person just as it is part of
its conceptual content to be old? Or do the concepts of being a
person and being old enter in different ways into the meaning of
"elderly"? If our intuitions are not clear on this question we
need some independent argument by which to choose between the two
proposed methods of dealing with selection restriction. The fol-
lowing observations will provide such an argument and also will
help to clarify what underlies the fel difference between selec-
tive and content determining aspects of meaning.

It will be seen that the dependency structure method loses
the distinction between anomalous and contradictory phrases be-
cause in any adequate formulation of the method either contradic-
tory phrases are classified as anomalous or anomalous phrases are
classified as contradictory. For the dependency structure method
to perform its desired function an additional rule, not stated by

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*The advocate of selection restrictions can retort that in this
special case, some form of (vert) is used in the selection
restriction and in the list of semantic markers. We will see
below how this can be done.

Bierwisch, on the matching of dependency structures must be
added:

> Two dependency structures, D_1 and D_2 do not match if when
> D_1 is mapped into D_2 any branch has antonymous markers.

For example, let (+A) and (-A) be antonymous markers. Then
(B)(+A) does not match either (B)(-A) or

$$
\begin{array}{c}
(C) \\
\diagup \quad \diagdown \\
(B) \qquad (G) \\
| \qquad\quad | \\
(-A) \quad (F)
\end{array}
$$
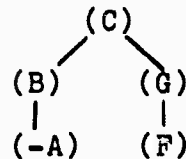
If this rule is not included we could, for example, map
(1 space)(+vert) onto any branch starting with (1 space)*
including the branch (1 space)(+main)(-vert) of "cigarette".
This would make "high cigarette" contradictory instead of
anomalous. The same goes for "long tower" and "long pole which
is a high pole". On the other hand, if the rule is admitted in
general form most, if not all phrases which should be marked as
contradictory will turn out not to have readings and be marked
anomalous.

We can show pretty clearly that the loss of contradictory
readings (upon adoption of the new rule) results from the failure
to employ some distinction tantamount to a distinction between
selection restrictions and the semantic markers determining con-
ceptual content of a reading. The intuitive distinction between
a contradictory phrase (e.g. "female uncle") and an anomalous or
meaningless phrase (e.g., "sleepy table") is that the first ex-
press incompatible conceptual components whereas the second does
not express any concept at all. This distinction between contra-
diction and anomaly is to be reflected in the theory by amalgamating

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*Presumedly, (1 space) will never depend on (+vert).

antonymous markers in the one case and by blocking amalgamation
in the other. But with the dependency structure mechanism, aug-
mented by the rule I have described above, both cases are lumped
together under anomaly; and contradictory expressions are not
given readings.

This state of affairs is unacceptable. We must count as
inadequate a semantic theory which cannot differentiate between
contradictory and non-contradictory readings (in the present case
because contradictory readings cannot arise). This distinction,
which some may argue is unclear or unimportant, is not alone at
stake; the analysis of analytic expressions (the denial of a
contradiction) and, in turn, logical entailment is inseparably
connected to the identification of contradictory readings (cf.
Katz, Analyticity and Contradiction in Natural Languages).

Since semantic theory cannot dispense with the classifica-
tion of contradictory readings, a proponent of the dependency
structure method might make the move of rejecting my additional
rule and arguing that phrases such as "high cigarette" and "long
tower" are contradictory, as they would be marked by the original
form of the dependency structure method, and not anomalous.
After all, such a person might argue, by "something long" we
understand something not vertical, so by "long tower" we under-
stand something vertical and not vertical, i.e. a contradiction.

This argument, that "long tower" should be counted as con-
tradictory, is not without force; but it shows too much. "Sleepy
idea" can be shown to be contradictory in the same way. From the
point of view of the selection restriction advocate, the fallacy
in the foregoing argument probably is to be found in the state-
ment, "by 'something long' we understand something not vertical."
This is so, but only because the marker (-vert) is pulled out of
the selection restriction of "long" by the action of the pro-form

"something" (For a description of this effect of pro-forms,
see Katz and Postal, An Integrated Theory, on the definition
of (selector), p. 83).

A more powerful heuristic argument a dependency structure
advocate could use might go like this: "Long" is predicable
of the sorts of things of which a tower is an example (shaped,
physical objects), so "long" is meaningfully predicable of
"tower". In terms of selection restrictions the selection re-
striction of "long" will be $\langle$(physical object)$_\wedge$(shaped)$\rangle$. But
"sleepy" is not predicable of the sorts of things of which an
idea is an example. Again in terms of selection restriction,
the selection restriction of "sleepy" will be something like
$\langle$(animal)$_\wedge$....$\rangle$, and (animal) will not be found among the sem-
antic markers of "idea". Since predications like "long tower"
are meaningful but somehow wrong or vacuous, they are best counted
as contradictory.

Though seductive, this argument is not conclusive, for
although "long" is meaningfully predicable of most shaped,
physical objects it does not follow that it is meaningfully
predicable of all. In terms of selection restrictions, the
characterization of the selection restriction of "long" as
$\langle$(physical object) (shaped)$\rangle$ is incomplete. How the selection
restriction must be extended will be discussed shortly.

There are powerful positive arguments for rejecting the
attempt to save the dependency structure by allowing phrases such
as "long tower" to be marked as contradictory instead of anoma-
lous. For example, in such a theory, without my added rule,
"This box is long, wide, and high." would have a (contradictory)
reading in which "long", "high", and "wide" would all characterize
the same dimension. In fact, ignoring any ambiguity of the words
involved, this expression would have no less than five readings,

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four of which (those for which two of the adjective characterize
a single branch) would be contradictory. This conflicts with our
intuition that the sentence has a single reading, that is, that it
has a single unambiguous and non-contradictory sense (again, if we
discount ambiguity of the individual words). When we also take
into account the ambiguity of constituent sub-expressions of a
sentence the classification of anomalous expressions as contra-
dictory becomes still more objectionable. In most examples of
sentences containing several ambiguous words, there are far fewer
possible interpretations of the sentence than the number of
readings that would arise if we were to permit the amalgamation
of each reading of each ambiguous word with the remaining con-
stituents of the sentence. For example, "deposit" as a verb is
at least three ways ambiguous; "check" as a noun is at least
eleven ways ambiguous; and "bank" as a noun, is at least six
ways ambiguous. If some amalgamations are not prevented, we
would have at least 198 readings for "He deposited the check in
the bank". In fact, this sentence has far fewer possible inter-
pretations (though more than one would guess at first glance).
To give a sample of readings which are excluded, we can interpret
"deposit" as giving something as security or in partial payment,
"bank" as a pile or slope, and "check" as any one of its eleven
(or more) readings.

By way of contrast, we should compare the above example with
a sentence which has more than one sense at least one of which is
contradictory. Such a case can be found in the sentence "Some
bachelors are female." Here there is a sense in which femaleness
is predicated of unmarried adult males. But another of its sen-
ses expresses the trivial truth that there are some ex-coeds.
When we compare the ambiguity in such an example with the pur-
ported ambiguity of the previous example it becomes immediately

clear that what would be taken as contradictory senses in
Bierwisch's theory are not senses of the sentence at all. To
take them as genuine senses would make the extraordinary claim
that the sentence given in the previous example would be marked
as 198 ways ambiguous.

We have to conclude that a semantic theory must retain the
concept of anomalous expressions, expressions for which the
amalgamation of readings of constituent expressions is blocked.
Of course, the concept of anomaly is not entirely given up in the
theory as presented by Bierwisch; many amalgamations may still
be blocked by the dependency matching rules which are given in
his paper. However, we have seen that the rules he states are
inadequate for the examples he considers, and there is no a priori
reason to suppose that other kinds of examples (such as the ana-
lysis of a full sentence like "He deposited the check in the
bank.") can be handled in a natural and non ad hoc manner in his
system.

So far we have seen that semantic theory is inadequate if
selection restrictions are rejected, whether or not one includes
the additional rule which is required to make dependency struc-
tures operate as Bierwisch intended. If the rule is included,
contradictory readings cannot arise, with the result that the
analysis of contradiction, analyticity, and entailment is no
longer possible. If we omit the rule, many, perhaps all amalga-
mations which should be blocked are permitted by the theory, giving
an inadequate analysis of anomaly and ambiguity. These difficulties
make the old concept of selection restriction very desirable; but
we cannot clearly opt for it without showing that the special
problems of selection arising from spatial adjectives, for which
the dependency structure mechanism was designed, can be handled as
well by selection restrictions.

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An immediate problem is to deal with the function of (+vert) in "high". (+vert) must appear in the list of semantic markers which characterize the conceptual content of "high" because "pole" is not marked (+vert) but "high pole" is. Furthermore, (±vert) must somehow be used in the selection restriction of "high" so that "high cigarette" is marked as anomalous and "high tower" is given a reading. However, we cannot simply list (+vert) in the selection restriction for then "high pole" would not receive its desired reading. Listing (-vert) is clearly no help either. The desired restriction is that (+vert) be present in the modified word, as in the case of "tower", or that neither (+vert) nor (-vert) be present, as in "pole". That is, the condition of amalgamation has to be that (-vert) <u>not</u> be among the semantic markers of the word modified. We may mark this by writing $\overline{(-vert)}$ in the selection restriction of "high"[*]. In general, if (A) is a semantic marker, $\overline{(A)}$ can appear in a selection restriction and will be read, "not A". It is interpreted by blocking amalgamation of a phrases P_1 having selection restriction $\langle ...\overline{(A)}...\rangle$ only if (A) <u>does</u> appear among the semantic markers of the phrase P_2 with which P_1 is to be amalgamated.[**]

Although not common, one can find other examples of this form of selection restriction. Consider:

<div align="center">

sincere behavior
sincere statement
*sincere twitch

</div>

An action which, by virtue of the meaning of its name, is not intentional cannot be characterized as sincere, as in the example of "sincere twitch". Thus we must put something in the selection restriction of "sincere" to block amalgamation of "sincere" with

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[*]Of course this is a partial description of the selection restriction. More will be filled in later.

[**]This construction has already been described by Katz in <u>The Philosophy of Language</u>. p. 160.

words which have the semantic marker (-intentional). But this
could not be accomplished by putting the marker (+intentional)
in the selection restriction of "sincere", for then "sincere
behavior" would be anomalous. So the selection restriction of
"sincere" must be of the form $\langle ...\overline{(-intentional)}...\rangle$. In addition,
"sincere" must have (+intentional) in its list of semantic markers
because behavior is not always intentional, but sincere behavior,
by virtue of the meaning of the word, is. The situation is com-
pletely analoguous to that of "high" and (±vert).

It must be admitted that the function of markers of the form
$\overline{(K)}$ in a selection restriction only redoes what dependency struc-
tures did in a more elegant way. In a dependency structure, one
listing of (K) had the effect both of (K) on the list of semantic
markers determining conceptual content, and also as $\overline{(A/(K))}$ in the
selection restriction, where A/(-) is the antonymy operator which
picks out the markers antonymous to the marker entered as the ar-
gument in (-) (See Katz, Philosophy of Language, p. 199). This
is because the presence of (K) in a dependency structure blocks
amalgamation only if (K'), antonymous with (K), is present in a
second dependency structure to be amalgamated. It is regrettable
that the dependency structure method runs into so many difficul-
ties; in any case, the attempt to use it has brought to light evi-
dence for the need to employ markers of the form $\overline{(K)}$ in selection
restrictions.

We have been considering the question whether the selective
function of dependency structures can be accomplished using the
old form of selection restrictions. One special construction for
selection restrictions has been seen to be necessary for this task.
A second problem requires a more radical solution. As used up to
this time, selection restrictions effect the process of amalgama-
tion only by giving conditions, in terms of the presence or absence
of individual markers, under which amalgamation may take place.

However, there is also a question of the placement of a marker
when amalgamation occurs; when an object such as a car or pole
is characterized as high, a (+pol) marker and in some cases (e.g.
for "pole") a (+vert) marker must be injected <u>into</u> a dependency
structure below the most superficial level. For example, suppose
we need to represent amalgamation of the marker (W) with the
complex marker

$$R \overset{\text{def}}{=} (\ (A)(\ (B),\ (C)\ )\ )$$

to get $(\ (A)(\ (B),\ (C),\ (W)\ )\ )$

The only way suggested by Katz to determine the point within the
structure of a marker at which another marker or set of markers
should be embedded by the operation of projection rules is to
permanently mark R with a categorized variable, V, at the place
where (W) may be injected and to add a projection rule which
substitutes (W) just in case (W) is the reading of a constituent
that bears the grammatical relation in terms of which V is cate-
gorized. (See Katz on injection of readings for subject and ob-
jects into the reading for a verb - <u>Philosophy of Language</u>, p. 170
and on the reddings of relative size adjectives in "Recent Issues..",

p. 186-7.) But such an analysis enormously complicates the read-
ings which are in question. Consider the reading for "pole": the
(+max) dimension of "pole" can be characterized as (+pol), (-pol),
(+vert), and (-vert). The other two dimensions can also be char-
acterized together as (+pol) and (-pol). This already requires
six categorized variables and the final number is likely to be much
larger when other conditions, not yet studied, are taken into ac-
count (e.g. "slanted pole"). For each of these categorized vari-
ables there must be a special substitution convention. Perhaps
the number of variables could be reduced by using one variable for
(± vert) and one for (±pole), however the total is still at least
three and the corresponding substitution convensions would be a

little more complex. In the case of other objects (e.g. box)
variables would have to be included on every branch for (+max)
and possibly for other markers.

This displeasing complexity leads one to suspect that some
simplifying regularity is being missed. If some method could be
found to characterize in terms of other parts of the reading in a
simple and uniform way the place where markers such as ($\pm$vert)
and ($\pm$pol) are to be inserted the categorized variables would be
evidently superfluous. This was just the effect of Bierwisch's
dependency structure method. The location for insertion of a
marker (W) was identified by the matching of the structure of the
reading, R_1, into which (W) is to be inserted and the reading,
R_2, of which (W) is a part. The dependency structure method won-
derfully simplifies the problem of amalgamation of structured
readings, but fails to make the necessary distinction between
selective restriction and conceptual content components of meaning.
The selection restriction method performs this second task but
fails to give a pleasing solution to the first problem.

A solution to this impasse can be found by examining a little
more carefully the current status of selection restrictions. In the
original presentation of the concept (cf. Katz and Foder) the only
kind of reading described consisted of an unstructured list of semantic
markers and a selection restriction which gave a boolean condition
stating which markers had to be in the unstructured list of markers
of a second reading in order for amalgamation of the two readings
to take place. But now, the conceptual content of a reading is no
longer given by an unstructured list, but by a dependency structure.
Consequently, it is no longer possible to describe the restrictions
on the amalgamation of readings by simply stating in the selection
restriction what markers must be present or absent in a second
reading to be amalgamated; for the second reading will (in general)
not have an unordered set of markers, but a collection of markers

tied together in some specific structure. For the moment, let
us take "high" as a paradigm; when discussing the selection
restriction of "high" earlier, we concluded that the required
condition on the modified head, R, with which "high" is to be
amalgamated is that R should <u>not</u> have the marker (-vert).* But
this is insufficient; the requirement cannot be that (-vert) not
appear anywhere in the structure. (-vert) might be used in some
way irrelevant to the application of "high", as for example, in
describing the orientation of an axis instead of its length (see
the section below on "put" "lay" and "stand"). Rather we must
require that (-vert) not appear in some specific place in the
structure of R. Examining cases such as "high cigarette" and
"high floor" one can see that it is only the axes of R which must
not be characterized as (-vert). Furthermore, "high" cannot be
amalgamated with R unless R is characterized as having at least
one axis. Lastly, only a (+main) axis can be characterized by
"high". A high pole is one whose (+main) axis is of great extreme,
not one which is oriented horizontally and is very thick. The
full requirement is now that R have an axis marked (+main) and that
at least one such axis not be also characterized as (-vert) if
"high" is to apply. These facts can be represented in the theory
by giving the selection restriction of "high" as

$$< (1 \text{ space}) \ (+\text{main}) \ \overline{(-\text{vert})} \ >$$

and interpreting it as requiring R to have a sub-structure which
agrees with(that is to say, exactly matches) the structure given
in the selection restriction. Generalizing from this example
suggests that selection restrictions should be interpreted as
giving a restriction on the structure of a reading R to be

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*To simplify the analysis, we will restrict R to be a noun
naming a rigid physical object.

amalgamated by listing a dependency sub-tree which must exactly
match a sub-tree of R. The new matching rule should be identical
to that of Bierwisch (statement (37) p. 27) with the last clause,
"in case Z_i and Z_j are in T" left out. The effect of this change
is to require all the elements of a dependency structure to appear
in a sub-tree which it exactly matches.

However, we have still not fully described the processes of
amalgamation of two dependency structure readings, P and R. We
have seen that P will have the form M ⟨SR⟩, where M, the concep-
tual content, and SR, the selection restriction, are both depen-
dency structures; amalgamation takes place on the condition that
SR exactly matches a sub-tree of R. But where in the structure of
R will M be inserted? It cannot, in general, be just anywhere,
or at the most superficial level; in the case of the reading of
"high" M will be (+pol)(+vert), which must be inserted on a

(1 space)(+main) branch which is not also marked with (-vert). But
now we note that, at least in the case of "high", the place of in-
sertion of M can be easily characterized in terms of the selection
restriction ⟨(1 space)(+main)$\overline{(-vert)}$⟩. (+pol)(+vert) must be in-
serted on just the sort of branch characterized by the selection
restriction of "high". This can be indicated by writing the sel-
ection restriction as

$$\langle (1 \text{ space})(+main)\overline{(-vert)}*)\rangle$$

where * is a dummy marker indicating the point of insertion in
a structure.

The full interpretation of a selection restriction can now
be given as:

1) a reading M⟨SR_1⟩ is amalgamated with a reading R⟨SR_2⟩
    just in case SR_1 matches a sub-tree of R. Of course,
    in determining the matching, the dummy marker * is
    treated as null.

2) In case there is such a match, M is inserted into R at
    the place indicated by the dummy marker * in SR_1.

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We may hope that selection restrictions can be given purely on the basis of describing the restrictions on amalgamating readings. When this is possible (as in the one example given so far) the information describing the place of insertion comes essentially free, requiring only the placement of the one dummy symbol * at one place in the selection restriction, and removing the necessity of weighting down the semantic description with a multitude of categorized variables and special insertion rules.

It is important to note that my proposal is really little more than Bierwisch's dependency rule reinterpreted to preserve the distinction between selection restrictions and conceptual content. A dependency rule (p. 27-28) had the form $M[D]$, where M, the modification and D, the domain, are dependency structures and D contains in its structure the dummy element, *. Amalgamation with a structure R is effected when D matches a sub-structure of R and M is inserted at the location in that structure marked by *. But the machinery I have presented is the same as Bierwisch's, after D has been reinterpreted as the selection restriction and the necessary adjustments have been made to accommodate such a reinterpretation.

So far I have illustrated the proposal with only one example. And likely enough it will turn out that the necessary structural information will not always be available in the selection restriction, viewing the selection restriction, as before, as a device for determining the compatability of readings. The insertion of subject and object readings into the reading of a verb will clearly need dummy variables in the verb's reading. But, as Katz has observed (in conversation) the need of a special projection rule for each of these dummy variables can be eliminated by a single general projection rule for all categorized variables which says that a reading of a constituent is substituted for a categorized variable V^G just in case the constituent bears the grammatical relation G to the constituent in whose reading V^G occurs.

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Having two types of machinery for locating one reading
within another, the question naturally arises what considera-
tions are involved in the choice to use one of these types of
machinery rather than the other in the treatment of a given
case. We can make a suggestion as to what some of these con-
siderations are. The use of categorized variables has the ad-
vantage of locating the position in the reading in which another
will be embedded. The advantage of having such a position marker
is clear in the following kinds of cases: First, where the read-
ing contains two or more embedding positions and where the read-
ings to be embedded in one or another of these positions can have
the same selection restriction. Second, categorized variables are
needed where the reading into which another reading is embedded
contributes semantic markers to the reading embedded in it. An
example of this situation can be found in Katz's treatment of
"chase" in The Philosophy of Language, p. 167. On this analysis
the reading for the subject in the expression "X chases Y" is
modified by the meaning of the verb, "chase", to indicate that
X is moving at a fast rate. And third, categorized variables are
needed where there is a selection restriction in a reading govern-
ing the readings which may be embedded in it and where the absence
of a reading to embed requires that the unfilled position be filled
with the selection restriction on that position. For example "Mary
bought a book from X" is anomalous when the reading substituted
for X does not fall into the category of persons or social organi-
zations. So the categorized variable marking the place of inser-
tion of the indirect object must be governed with a selection
restriction of the form $<(human)\lor(organization)>$. At the same
time when the indirect object is omitted, as in "Mary bought a
book." it is understood that the agent bought the book from a
person or organization. This fact can now be represented by
stipulating that when a categorized variable has not been replaced

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by a reading, when all amalgamations have been completed, the
reading (or readings) in the selection restriction replace
the categorized variable. It is easy to find any number of
examples showing the need of this stipulation*.

It is also quite likely that the treatment of adjectives
such as "big" and "old" as relative to the lowest semantic cate-
gory of the modified head (cf. Katz, "Recent Issues" pp. 186-8)
will require categorized variables and corresponding special rules.
But we may hope that in most other instances of the modifier -
head relation the information which must be in the selection
restriction to determine compatibility of readings will also
suffice to characterize the place of insertion of one reading into
another. This can be illustrated by examples which have already
been discussed in the literature.

(1) Perhaps the simplest case is that of a modifier and head
which are each described by an unordered set of semantic markers,
along the lines of the original Katz and Fodor presentation (cf.
Katz and Fodor, "Structure of a Semantic Theory"). The two
readings are amalgamated by simply taking the union of the two
sets of markers; and such an amalgamation takes place just in
case for each reading we have satisfaction of the selection re-
striction which specifies the markers the other readings must have.
This can be taken to be the degenerate case of the system now
being proposed, with both dependency structures in a reading being
degenerate. The reading for the modifier would have the form
$(X)<((D_1), (D_2),...,(D_n)),*>$ where X is the list of semantic mar-
kers to be amalgamated and $(D_1),...,(D_n)$ are the semantic markers
which must be in the reading of the head. Other boolean combina-
tions of markers in the selection restriction are permitted. In

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*Details of this analysis are to appear in Katz's work on states
and processes, now in progress.

the same way as the former kind of selection restriction used
boolean combinations of markers, with the present concept of
selection restrictions we may allow boolean combinations of de-
pendency structures. Thus $(X) < (D_1) \lor (D_2), *>$ has the same force as
the disjunction of readings: $(X) < (D_1), *>$ or $(X) < (D_1), *>$.

(2) Since the present interpretation of selection restric-
tions is a direct reinterpretation of Bierwisch's system, his
examples with spatial adjectives carry over immediately. The ex-
ample of "high" already described can be summarized in the reading
$(+pol)(+vert) \langle (1 \text{ space})(+main)\overline{(-vert)}* \rangle$. "Big" characterizes
any set of (+main) dimensions and otherwise is not applicable.
So the selection restriction must have the form $\langle (n \text{ space})(+main) \rangle$.
The whole reading can be given as $(+pol) \langle (n \text{ space})(+main)* \rangle$.*
The other examples of spatial adjectives follow similarly.

(3) As a final example, consider the immediate simplifica-
tion which the system being proposed effects in Katz's analysis
of "good" (see <u>Philosophy of Language</u>, pp. 289-302). The reading
suggested for "good" is $(+) \langle (\text{Eval}_x( )) \rangle$. When $(+) \langle (\text{Eval}_x( )) \rangle$
is amalgamated with a reading $(M_1)...(\text{Eval}_x(Y))...(M_1)\langle SR \rangle$, a
special rule moves the (+) in the derived reading

$$(M_1)...(\text{Eval}_x(Y))...(M_1),(+)\langle SR \rangle$$

to the evaluation marker, giving the final form as

$$(M_1)...((+)\text{Eval}_x(Y))...(M_1)\langle SR \rangle$$

However, if selection restrictions are being used to indicate
the place of insertion we can give the definition of "good" as

$$(+)\langle *(\text{Eval}_x()) \rangle.$$

The (+) will then be inserted at the right place on the basis
of the single generally applicable projection rule, without any
special rule for the definition in question.

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*The problem being discussed here - at what place in the reading
of the head the reading for the modifier, "big", should go - must
not be confused with the separate problem of how the reading of
"big" itself should be modified to relativize it to the lowest
semantic category of the reading of a head. This is the problem
mentioned by Bierwisch on page 10, to which Katz proposes a solution
in "Recent Issues", pp. 186-8.

PART II

In this part of the present paper I will attempt to extend
Bierwisch's application of the semantic markers which he intro-
duced in analyzing spatial adjectives.

"ROOM", "BOARD", AND "LONG"

The words "room", "board", and "long" bring out some prob-
lems in the use of the markers (+max) and (-max). Bierwisch
suggests (in effect) that the conceptual content of "long"
be characterized with (+max) and the selection restriction with
(-max). The first statement cannot be correct because it is
perfectly proper and not contradictory to say of certain rooms
that, "This room is wider than it is long," particularly if the
room has an orientation, either inherently or with respect to
observers. (e.g., a lecture hall or auditorium). But for many
words, such as "board", the dimension characterized by "long"
cannot be less than the one characterized by "wide". These facts
can all be captured by putting (-second) in the selection restric-
tion of "long" and characterizing the two main dimensions of
"board", one with (+second) and the other with (-second)(not(-max)),
where (not(-max)) is to be interpreted as characterizing the di-
mension as not less than any other.* We need (not(-max)) instead
of (+max) to be able to treat square boards. The word "rectangle"
is treated in the same manner. By way of contrast, "knife",
"road", and "oblong" will have their (+main) dimensions charac-
terized by (+second) and (-second) (+max) respectively, since,
for each of these words, the dimension characterized by long
must be greater than the other (+main) dimension.

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*(not (-max)) must be considered as a different marker from (-max).
If (-max) appeared outside a selection restriction, any (-max)
inside a selection restriction would have the function of requir-
ing (-max) to be present in a reading, instead of requiring (-max)
not to be present in the reading.

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"Board", "road", "knife", "oblong", and "auditorium"
should all have their (-second) dimension characterized as
(+inherent) since the fact that this dimension is character-
ized by long is not a context dependent property of these ob-
jects. "Room" is problematic in this respect, for sometimes
which dimension is characterized by "long" depends on orienta-
tion with respect to observers, but sometimes the choice depends
on inherent properties of the room, as when the room is a class
room or when observer orientation is not relevant (e.g., no
one is in the room and the room has a maximal, nonvertical di-
mension). Perhaps this ambiguity can be captured by simply not
marking the (-second) dimension of "room" with either (+observer)
or (+inherent) or any comrlex marker built up from these two.

ORIENTATION OF POLARITIES

Bierwisch introduces a notion of orientation of antonymous
pairs of adjectives, such as fast/slow or long/short, by noting
that only the first members can be combined with phrases such
as "twice as" or "half as". He takes as examples

> twice as fast
> *half as slow
> twice as long
> *half as short

Furthermore, this same polarity corresponds to the applicability
of measure phrases. For example:

> two feet long
> *two feet short

However, as Bierwisch himself notes, we do say "a thread twice
as thin as a hair." What then is the relation of the phrases
"twice as" and "half as" to such antonymous pairs of adjectives?

We seem to use "twice as thin" or "half as thin" when we
are concerned with objects which are thin compared to the aver-
age of objects in their class. If this is the case we should

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use "twice (half) as thick" for comparatively thick items;
and surely, if we are comparing two big, thick boards we say,
"This one is twice as thick as that one." in preference to
"That one is half as thin as this one."

If this regularity for "thick" and "thin" is a real one,
it would be surprising if the same did not hold for other ad-
jectives of measurement. Indeed, we <u>do</u> use "half (twice) as
slow" if we are talking about things which move very slowly,
such as turtles, snails (which are slow for animals), or cars
in a traffic jam (which are slow for cars). We can say that
one newborn infant is twice as young as another. And it is, at
least linguistically, perfectly appropriate to describe Jane's
mini-skirt as twice as short as Mary's.

An alternative way of looking at the phenomena which
Bierwisch points out in this connection is to say that expres-
sions like "My car is twice as slow as your car" are not seman-
tically anomalous; and in fact, "My car is twice as slow as your
car" is synonymous with "My car is half as fast as your car."
Rather, the oddity in the cases Bierwisch describes as anomalous
might result from use of an expression when the quality or at-
tribute which has been adopted as the subject of conversation
is named by an expression antonymous to the one being used.
This would be to treat the difference between cases in which
cars are described as twice as slow or fast as other cars as
the same type of difference that can be found in connection with
the words "sweat" and "perspire" which are synonymous in the
grammar but where the former is said of men and the latter of
women.

Bierwisch asserts that measure phrases, such as "10 feet"
and "4 yards", always take the member of an antonymous pair

characterized by the (+pol) marker. Thus:

> 10 feet long
> *10 feet short
> 4 years old
> *4 years young

But this is only the case for adjective pairs which determine
a scale of measurement which admits of only positive measure
from a zero point. For any adjective pair which determines a
scale which admits of positive or negative measure from a zero
point, the applicability of measure phrases is symetric.
Thus:

> 4 hours early
> 4 hours late*

"PUT", "PLACE", "SET", "LAY", AND "STAND"

I will use some of Bierwisch's markers in a sample in-
vestigation of several verbs having to do with the positioning
of physical objects. I will not attempt full analysis of the
verbs, but only treat questions relating to orientation. It is
to be understood that the analyses are intended to hold only for
literal applications to physical objects and do not always hold
for derivative applications, for example to abstract objects,
as in, "I put the question to him." or in "His interests were
put before mine."

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*Also

> 4 feet advanced
> 4 feet regressed
> elevated 4 feet
> depressed 4 feet
> 4 feet ahead/behind
> 4 feet above/below.

Since these phrases arise from structures quite different from
the adjectives under consideration it is not clear to me whether
or not they are real examples of the sort of scale with positive
and negative measurement which the pair early/late exhibits.

In studying these verbs I have used the following heuristic tool: use the verb in a command, and then ask yourself what position of the object must result for the command to be correctly executed. Thus, a correct response to "Lay the book on the table" is to position the book with one of its covers on the table; any other positioning is a failure to execute the command. It is such a resultant position required by the meaning of the verb and exhibited by my tool that I wish to characterize in the analysis of these verbs.

This characterization will be accomplished by taking the reading for the object of the verb and adding semantic markers which describe the required position of the object. The reading thus derived describes (one element of) the terminal state of the process into which the verb is analysed. More formally, the terminal state in the analysis of the verb is (partially) characterized by the complex marker

$$(\ (\ (Q(a)) \langle SR \rangle) \ (X_0))$$

where X_0 is the categorized variable for the object, (a) is a semantic marker and ((Q(a))) is to be amalgamated by the usual rules with the reading put in for X_0, according to the selection restriction $\langle SR \rangle$. The reason for using the complex semantic marker $(Q(a))$ instead of simply (a) is as follows. Certain axes of an object (say, that axis of a bottle which is normally vertical) will be characterized as having a certain orientation in the terminal state (e.g., horizontal, as in "Lay the bottle on the table."). Thus the (+vert) axis of the reading for "bottle" must be characterized, in the resultant reading, as having the orientation (-vert). But we cannot represent this by simply amalgamating (-vert) with (+vert), which would result in an unwanted contradictory reading. Rather, we must separate the markers indicating the relevant axis of the object and the characterization of the orientation of that axis. This separation

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is accomplished by embedding, not (-vert), but (Q(-vert)) where
Q can be thought of standing for "orientation."

Now, let us apply these devices to several verbs. "Put",
I claim, is completely neutral with respect to resultant orienta-
tion. Consider

> Put the knife
>   bottle
>   book
>   tablecloth
>   card
>   match box
>   coffin
>   pot
>   etc... on the table.

To position any of these objects in any orientation on the
table is to correctly carry out the command. "Place" and "set"
seem to me to be completely synonymous with "put" in this respect.
This neutrality of final position can be indicated by simply
omitting the marker

$$(\quad (\quad (Q(a)) \quad <(SR>) \quad (X_o)).$$

Next consider "lay". The examples, except possibly for
"match box" and "coffin", seem to indicate that the terminal posi-
tion of the object must be one such that as many main dimensions
as possible are horizontal. Thus "Lay the book..." shows that
reference to a vertical dimension will not work and that some-
times we must require two main dimensions to be horizontal; for to
position the book on its binding is not to carry out the command.
In some cases we can only restrict one main dimension, since the
object may have only one, as for "thread" and "bottle". The
marker, as so far described, would look like this:

$$(\quad (\quad (Q(-vert)), \quad \langle((n \leq 2 \text{ space}) (+main)^*)\rangle) \quad (X_o) \quad)$$

The marker (($n \leq 2$ space) (+main)) picks out an (n space) branch
marked (+main) with n as large as possible ≤ 2. (A marker, (n
space), (without the restriction ≤ 2) with the same convection is

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already independently needed to handle "big" and "thick", as
described by Bierwisch, p. 30.)

    But "coffin" and "match box" seem to show this analysis in-
sufficient; for all three of their axes are (+main), but to stand
a coffin or match box on end is not to follow the command, "Lay
the match box/coffin on the table." There seems to be the fur-
thur requirement that a maximal dimension, if one occurs, must be
positioned horizontally. We are faced with the further complica-
tion that match boxes and coffins do not have a maximal dimension
by virtue of the meaning of the words. Consider, for example, a
coffin shaped to hold the bodies of a man and wife; the container
might well be of equal length and width. But, I claim, this com-
plication is apparently only; the presence of a marker (+max) if
in these expressions at all, arises by injection from contextual
information as can be seen by considering what we would say or do
in response to these commands if we imagine we had no idea from
empirical information of how these objects are usually shaped.

    This observation does not eliminate the problem of how to
handle a (+max) marker when it does occur, for example, when its
presence is made explicit in the linguistic context. Consider,

        Lay the box which is three feet by one foot by one
        foot on the table.

To stand such a box on end is not to carry out the order. Further-
more, uses of "lay" in statements result in final readings in
which the object either is characterized as having a maximal
dimension positioned horizontally, or, more likely, is character-
ized as not having a maximal dimension positioned vertically.
Thus, it follows logically from "John layed my box on the table.",
that my box did not have a maximal dimension positioned vertically.

    The requirements for orientation in the terminal state of
"lay" can now be summed up as follows: If the object has one
main dimension, it must be characterized as horizontal. If the

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object has two or three main dimensions, two of these must be
characterized as horizontal. If, in addition, one of the main
dimensions is characterized as (+max), this dimension must be
among those characterized as horizontal.[*] This set of conditions
can be represented in the selection restriction by a somewhat
messy but straightforward Boolean combination. Let the complex
marker (A=>B) be defined by $(\overline{A}\lor B)$, for semantic markers A and B.
Then the terminal condition is represent by

$$(\ (Q(-vert)) < (\ (\overline{+max}) \Rightarrow (m\leq 2\ space)(+main)^*)\ \lor$$

$$(\ (+max) \Rightarrow\ (n\leq 2\ space)(+main)^*\ (+max)\ ) > (X_o))$$

The verb "stand" (as in "Stand the lamp in the corner."),
appears to me to be entirely complementary to "lay" with respect
to terminal orientation. If one stands something one orients it
so that (i) a main dimension is oriented vertically. This
covers cases such as "Stand the book on the table.", where there
is no (+max) marker. And (ii), if an axis is marked (+max), it
must be the one oriented vertically.[*] Thus, "Stand the oblong
shaped box on the table." is not carried out unless its maximal
dimension is oriented vertically. The same sort of Boolean com-
bination can represent this pair of conditions:

$$(\ (Q(+vert)) < (\ (\overline{+max}) \Rightarrow (1space)(+main)^*)\ \lor$$

$$(\ (+max) \Rightarrow\ (1\ space)(+main)^*(+max)) > (X_o))$$

"HIGH", "TALL", AND "LOFTY"

I have not solved the problem of distinguishing between
"high" and "tall", but my efforts have brought out several
observations which may be worth noting.

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[*]It is very likely that, as a universal generalization, no (-main)
dimension will be characterized as (+max). So we need not worry
about this combination.

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There seems to be a real temptation to try to get around the problem by the following argument: "High", it will be said, is not an adjective of extension like "long" and "wide", but of position, like "distant".   Thus, when we characterize something as high, it is claimed that we are really saying that its top is at a high location.

This line of attack can be countered by showing that the use of "high" is ambiguous. It is important to become clearly aware of the two readings since confusing them leads to mistakes in all quarters.

The ambiguity is clearly exhibited in the following examples:

(a)   The cavern

(b)   room

(c)   table is high.

(a) can be true because the cavern is 100 feet from bottom to top or because, as a whole, it is located at elevation 10,000 feet in the Rocky Mountains. (b) can be true because the room is 15 feet from floor to ceiling or because it is located on the thirtieth floor of the Empire State Building. (c) can be true because the table has legs five feet in height or because it stands on a platform above the head of the speaker. The argument derives whatever plausibility it has by ignoring this ambiguity. On one reading, "high" is clearly analagous to "long" and not to "distant", and it is this reading which we would like to be able to distinguish from the reading for "tall".

As for attempts to separate "high" and "tall" semantically, several dictionaries suggest that things tend to be characterized as tall when they are thought of as growing or having grown, or when they are small in diameter compared to their height. Thus:

tall	man	high	mountain
	tree		plateau
	building		curtain
	grass		door

But there are counter examples:

      *tall spire   high spire
           geyser   geyser.

The words "post", "pole", and "tower" seem to me to provide clear
counter examples, though people's intuitions for these words seem
to vary a great deal. Particularly interesting is "tall growth"
and "high growth", both of which seem to be correct, as in "His
back yard is covered with a high/tall growth of weeds."

There are, however, some clear generalizations which seem
to hold for "lofty" relative to "high." "Lofty" has the same
ambiguity as "high." ("Lofty mountain," "eagle's lofty perch").
"Lofty", in its literal sense, means the same as high, except
for indicating a more extreme degree.

"Lofty" sorts with "high", with one exception: "lofty is not
used to characterize interior dimensions of an object. Thus,

      lofty room
          cavern
          chamber,

unambiguously means one located, as a whole, at a great height
and cannot mean "very high," where "high" has the reading analo-
gous to "long" and "wide". This contrast with "high" can be
easily marked by adding to the selection restriction of "high"
the complex marker ($\overline{+int}$) where (+int) is the marker suggested by
Bierwisch in his attempt to analyze the meaning of "deep", as in
"deep cabinet", by marking the notion of an interior dimension.*

"WIDE" AND "BROAD"

"Wide" and "broad" seem to be interchangeable with two ex-
ceptions:

Only "wide" is used to characterize interior dimensions.

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*Bierwisch's notation corresponding to my (+int) is (-plain).

Thus:

wide tunnel	*broad tunnel
room	room
doorway	doorway.

We immediately have another use of ($\overline{+int}$). Just as with "high" and "lofty" the reading of "broad" will differ from that of "wide" by the presence of the marker ($\overline{+int}$) in the selection restriction of "broad".

The second generalization is that "broad" never takes a measured phrase:

*two inches broad.

I have not been able to formalize this regularity in a non-ad hoc manner, though the analogy with "lofty" is suggestive, for "lofty" also does not take a measure phrase. One is tempted by the following speculation: there may be some connection between the fact that the concepts corresponding to "broad" and "lofty" are incompatible with interior dimensions, and the conceptualization of measurement of an object's dimensions as being between or bounded by its sides or ends.

There is also the possibility that "broad" and "lofty" will be prevented from combining with measure phrases on syntactic grounds. The problem is probably best treated in the broader context of questions about measure phrases which must deal with anomalies such as

*three pounds long
*two feet fast/early.

"BIG" AND "LARGE"

A simple case! These appear to me to be clearly synonymous; one dictionary suggests there is a difference in extremes indicated; but at best this is a stylistic variation, for consider,

I looked for something big, but found something large.
I looked for something large, but found something big.

These seem to me to be clearly on the same footing and clearly
contradictory. [For a description of the "but" test for the
comparison of two phrases see Katz, "Some Remarks on Quine on
Analyticity", pp. 47-50].

Another suggestion is that "little" indicates absolute size
while "small" indicates size relative to the class in which the
object falls. But again, the difference appears to be, at best,
stylistic or connotational. For all examples of the following
sort are contradictory.

I looked for a small orange but found a little orange.
I looked for a little orange but found a small orange.

"TOP", "FRONT", AND "SIDE"

I will present an analysis of the meaning of the words "top",
"bottom", "front", "back" and "side", taken as nouns. The con-
cepts developed will then provide an analysis of the adjectival
use of these words and will have an immediate application in
describing the semantics of certain locative prepositions, such
as "over", "under", "behind", etc.

Katz, Bierwisch, and others have defined nouns by specifying
a defining property, $P(Y)$. Thus bachelor is defined by the com-
posit property (male) (unmarried), etc. However, there is no
defining concept or property "topness" independent of some physi-
cal object or spatial figure of which something is the top.
Reference to "the top" must always be to the top of something.
Thus, the concept required is really a relation, $R(Y,X)$, "Y is
the top of X". The property "topness" can then be defined as
(EX) (X is a physical object or spatial figure and $R(Y,X)$).
Since an object or figure generally has only one top, R can be
thought of as a function which takes as its argument the concept
of a given figure or physical object, and which then singles out
the part of the object or figure which forms its top.

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Consequently, in describing the defining property of "top" I will explicitly show the argument of this function. The same remarks hold for "bottom", "front", and "back". "Side" is a relation of the same sort, but is not a function since generally a thing may have more than one side.

Initially, let us restrict ourselves to "top". The top of something can be a surface (as for the top of a piano), a line or edge (the top of the windowpane), an upper portion of a vertically-oriented surface (e. g. "the figure in the top of the picture"), or a point, or upper segment of a vertically oriented line or thin object (the top of the flag pole). Common to all these cases is the concept of a part, or sub-figure, Y, of a figure, X, where Y is an extremal portion of X. Y is unspecified by the concept as to shape or dimensionality; it may be either the extreme limit of X (such as the point which forms the very top of a flag pole) or may be a more substantial portion of X (such as the uppermost two feet of a 50 foot flag pole). I will represent this concept by introducing the marker (ex prt (X)) (read "extremal part of X") as the first marker used in characterizing the meaning of "top".[*] The marker (ex prt (X)) singles out a part or sub-figure of X which is then to be further characterized by other properties.

The top of an object is characterized by the object's vertical axis. Roughly speaking, the top lies in the plane which is perpendicular to the object's vertical axis. We will use (+vert) to represent this further characterization of (ex prt (X)) by letting (+vert) depend on (ex prt (X)), thereby indicating that

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[*] The ambiguity illustrated in the flag pole example might be eliminated by specifying whether Y has dimensionality equal to or less than the dimensionality of X. But for the present analysis I will lay this refinement aside.

(+vert) further characterizes (ex prt (X)). In this way, we
derive the complex marker ((ex prt (X)(+vert)). We could, of
course, spell out in more detail in the representation the way
(+vert) characterizes (ex prt (X)); but I shall simply take it to
be part of the intended interpretation of (ex prt (X)) that a
marker describing an axis and dependent on (ex prt (X)) is inter-
preted as determining the extremal part in question to be in a
plane perpendicular to the axis.

There are, of course, two such planes; one giving the loca-
tion of the top of X and the other giving the location of the
bottom of X. These can be distinguished by using the fact that a
(+vert) axis is not just a line or spatial orientation, but has a
directional orientation as well, with the positive sense of direc-
tion pointing upward (see Bierwisch, Section 3.2). We need a
pair of markers (+ext) and (-ext), read "plus extreme" and "minus
extreme", to pick between the two extremes of the axis. We now
have as the reading for top:

((ex prt (X)(+vert)(+ext))

and for bottom

((ex prt (X))(+vert)(-ext))

This is still not enough, for consider a bottle which is
lying on its side. The instruction to touch the top of the bottle
can be correctly interpreted in two-ways: (1) Touch the end of
the bottle through which one pours its contents, (2) Touch the
highest side of the bottle, i.e., the side which is now highest.
The distinction depends on whether the vertical axis referred to
in the definition of top is the axis which is normally vertical
or the axis which happens to be vertical at the moment. I will
mark this difference by introducing the marker (normal) which can
be used to further characterize (+vert). We now have two defini-
tions of "top", which corresponds to the cases (1) and (2) in the
last example.

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$top_1(X)$: ((ex prt X) ((+vert)(normal))(+ext))
$top_2(X)$: ((ex prt X) (+vert) (+ext))

A digression is needed here to explain why I am introducing
a new marker, (normal), instead of using Bierwisch's (+inherent).
In Bierwisch's analysis objects are defined as normally having cer-
tain characteristics by simply including the markers which represent
those characteristics in the appropriate place in the definition.
Thus, cigarette is defined as having its (+main) (+max) dimension
normally in a horizontal orientation by marking the (+main)(+max) dimen-
sion as (-vert). Contrast the role of (-vert) in cigarette with
the role of (+max) in, say, pole. The (+max) in pole must be
further characterized as (+inherent); for if an object does not
have a maximal dimension dimension, it is not a pole, whatever
its orientation. A cigarette, however, can be oriented vertic-
ally and still be a cigarette; a cigarette balanced on end is
just a cigarette in a funny orientation. However, in defining
"top", we cannot differentiate between a normal vertical orienta-
tion and a vertical orientation of the moment by simply including
or omitting the marker (+vert) because in both cases we need to
refer to or single out a vertical orientation. If we were to
omit (+vert) from the definition, we could not refer to a verti-
cal axis, normal or otherwise. Furthermore, the normal vertical
orientation referred to by $top_1(X)$ is not just orientation which
is normal by definition, but may be normal by facts about the
world which have no direct relation to the meaning of the express-
ion, X. For example, a bag or sack is thought of as normally
oriented with its open end up. But this is by no means true by
virtue of the meaning of the word "bag" as is shown by the
acceptability of "long bag", as compared to the unacceptability
of "*long tower". But the differentiation between $top_1(X)$ and
$top_2(X)$ holds for sack: think of a sack, filled with flour, and

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lying on its side. The command, "Touch the top of the sack.",
has the same ambiguity that it had for bottle. If this example
is not convincing, the same evidence can be adduced from the
phrase "inflated ballon". We see that, not only does (normal)
seem to be necessary, but it must refer either to orientation as
specified in the reading substituted for the parameter "X" or
directly to orientation which is learned as normal for the object
referred to by X.

The (+vert) which is not characterized as normal is to be
interpreted as the vertical of perceptual space; thus, the top_2
of a bottle is that side which is at the moment uppermost. A
few observations about the notion of perceptual space will help
us understand why the meaning of "front" cannot be handled in
exactly the same way as the meaning of "top". By perceptual space
I mean the three dimensional space which we think of as associ-
ated with each person's perception. The vertical axis of an ob-
server's perceptual space is the real vertical direction; the axis
of depth, or primary non-vertical axis, is the direction in which
he is facing, and his axis of width, or his secondary, non-vertical
dimension is the direction from his left to right. The important
fact here is that the vertical axis of all people's perceptual
space coincides (If an observer is not himself oriented verticaly,
he nevertheless thinks of the direction of free fall as his ver-
tical direction.) Thus, in giving the meaning of top, it was
sufficient to specify the orientation of the object either as
normal or as fixed by the immediate context. Given that the
orientation is normal, that is, that the object is in a context
in which it has its normal orientation, the vertical axis of the
object as seen from the point of view of any observer in that
context is the same. Consequently, it is not necessary to fur-
ther specify the vertical axis as the vertical axis of some par-
ticular observer in the context. Similarly, as long as the

context is specified or fixed, one can refer to the vertical of
that context as the vertical of any of its observers.

This simple fact becomes important when we notice that we
cannot distinguish between the two non-vertical dimensions in the
same easy way we can distinguish betwen vertical and horizontal.
This is because the forward direction for one observer in a given
context need not coincide with the forward direction of another
observer in that same context. Consequently, in picking out the
forward direction or axis of an object, we need to do more than
refer to the forward direction of a specified orientation (normal
or contextural). We must also specify: (1) with respect to whom
is the orientation given, and (2) what is the special relation of
that person to the object which specifies or picks out the orien-
tation. These complications explain why we cannot define a
$front_1(X)$ and $front_2(X)$ exactly analogously to the way we dis-
tinguish between $top_1(X)$ and $top_2(X)$.

In giving the reading for "front" we again use (ex prt (X));
for just as in the case of the top, the front is an extremal
portion of the object in the same general sense which includes
bounding points, edges, surfaces and segments of the object. For
example, the front of an arrow can refer to the very tip, or to
a whole forward portion of the arrow, say, the arrowhead. Just
as in the case of "top", we take (ex prt (X)) to be further speci-
fied by an axis with a sense of direction and an extreme on that
axis. The axis is, first of all (-vert), (this will be qualified
later on). The required (-vert) axis and its sense of direction
is singled out by some further property indicated by (+prominent).
So far, we have as a reading for "front":

          ((ex prt (X)) (-vert) (+prominent) (+ext))

In trying to determine the interpretation of (+prominent) I
have found a great deal of variation from person to person as to

what sort of things have fronts. For example, when asked to des-
cribe the front of a typewriter, trumpet, telescope, or mirror,
some people immediately picked out a part, while others found the
request bizarre. Some people seemed to think that trumpets have
fronts, typewriters do not, and so on. This might indicate that
the meaning of "front" varies a great deal from person tc person;
it is to be hoped that such a variation can be described by vari-
ations in the content of the single marker (+prominent). It is
also to be noted that in the case of objects for which a front is
not well determined, special terms often arise to describe the
part more clearly; for example, there is the bell of a trumpet,
the viewing side of a mirror, the keyboard of a typewriter, and
the business end of a gun.

One might try to interpret (+prominent) as "functionally
prominent", that is, oustanding or attention catching by virtue
of the function of the object. The function can be either the
normal function or some special function specified by the con-
text. This analysis seems to specify the correct side as the
front for the sort of things which everyone will agree have fronts,
and when "front" is used in this sense, hearers seem to interpret
the word as intended; however, on this analysis of (+prominent) a
great number of things are easily characterized as having a front
which most people seem to feel do not (e.g., pencil, spoon, saw).

Instead of referring to general functional prominence we may
try to list a more restricted set of characteristics which single
out the axis. On this analysis, an axis is (+prominent) if,

(1) It is the axis of motion of the object, with the positive
sense of the axis in the direction of motion. This gives the
front of a car, and the front of a moving ball. Or

(2) It is the axis of vision of some specific observer fac-
ing the object (either a normal observer or some observer speci-
fied by context.) The sense of orientation is toward the

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observer. This gives the front of a television set, the front of
a house, and the front of a mirror, or

(3) It is the axis along which motion or vision proceeds
through the object. Orientation is in the direction of motion or
vision. This gives the front of a telescope, the front of a
trumpet and the front of a fan or propellor.

This list is very unsatisfactory. In (2) the required ob-
server in the case of normal orientation is still unspecified.
Many people's use of front does not seem to conform to (3).

Whatever the correct interpretation of (+prominent) it must
have the characteristic of being applicable to an object in
different ways in different contexts, or even in the same context.
The front of a desk is usually thought of as the side where the
user sits. But if the desk is used for interviewing clients, say
by a doctor or business man, the clients' side may also be thought
of as the front.   A house trailer has two normal fronts; one is
the side by which it is pulled (hence, indicated by direction of
normal motion). The other is the side with the door (or main door
if there are two), and hence, the one faced by a normal observer.
The provisional description of (+prominent) accounts for these
cases of dual applicability of "front".

We distinguished between two meanings of "top" corresponding
to whether or not the relevant axis was marked as (normal). In
the case of "front" the relevant axis can be normal in two ways;
(a) the (-vert) marker may be further characterized as normal; or
(b) the (+prominent) marker may be further characterized as normal.
These cases give rise to four combinations

		(-vert)	(+prominent)
Marked with (normal):	(1)	yes	yes
	(2)	no	yes
	(3)	yes	no
	(4)	no	no

"Front of the man" and "front of the radio" are examples of
case (1). I cannot find an example for which (2) holds; this is
to be expected, because if an axis or side is prominent by virtue
of some normal function or property of the object, that same func-
tion or property will, in practice, lend a normal horizontal ori-
entation to the object. Thus "gun" might fall in case (2), since
it has a prominent axis; and there is nothing about this promin-
ence which logically forces the axis to be normally (-vert). But
in fact one generally shoots, roughly speaking, in a horizontal
direction instead of up or down, so that the axis of the gun
barrel comes to have its normal orientation in the plane.

A symmetrical, unlabeled bottle gives an example of case
(3), and a brick an example of case (4)* In neither case can the
object be described as having a front, even in very special situa-
tions. However, both (3) and (4) will be used in defining the
prepositions "before", "in front of", "behind" and "in back of".

Since only case (1) corresponds to situations in which an
object is characterized as having a front, we finally have as the
definition for front(X):

((ex prt (X)) ((-vert)(normal)) ((+prominent)(normal)) (+ext))
and for back(X):

((ex prt (X) ((-vert) (normal))

((+prominent) (normal)) (-ext))

For use in defining locative prepositions we give a function,
$front_p(X)$, corresponding to case (3) and (4), but not to any
English noun. $front_p(X)$ is defined as

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*The fact that no axis of a brick is singled out as normal can
be used to explain the oddity of "The brick is upside down",
though one can, of course, turn a brick upside down, since this
inversion is with respect not to a normal vertical axis, but the
vertical axis singled out by the immediate context.

((ex prt (X)) ((-vert)(normal))(+prominent)(+ext)) or

((ex prt (X)) ((-vert)(+prominent)(+ext)).

A function, $back_p(X)$ is defined analogously, by changing (+ext) to (-ext).

"SIDES" AND "ENDS"

"The length of a thing (a car) is the distance between its ends", and "The car is as long as it is from end to end" are analytic. "The car is twice as long as it is from end to end" is contradictory.

These examples show that the end of something is to be defined as an extreme or limit portion of its dimension of length, that is, the dimension marked as (-second):

end(X): ((ex prt (X)) (-second))

Just as in the case of "top" and "front", the end may be the extreme portion (say the last foot of a twenty foot pole) or the bounding surface or point (e.g., the surface at the end of the pole).

We can similarly treat that meaning of side which is analogous to end. "The width of the board is the distance between its sides" is analytic. "The board is twice as wide as it is from side to side" is contradictory. In the same way as for "end" such examples show that we should define side (on one reading) as:

$side_1(X)$: ((ex prt (X)) (+second))

The front of something may be a side or an end; for example, a house trailer has both a front end and a front side. The top can likewise be an end (top end of the bottle) or a side (top side of a desk). We can give possible readings for these expressions very simply in terms of the previous definitions (leaving out the marker (normal)).

front end(X): ((ex prt (X)) (-second) (-vert)
                            (+prominent) (+ext))
front side(X): ((ex prt (X)) (+second) (-vert)
                            (+prominent) (ext))

and similarly for "top end" and "top side".

"Side" has other possible interpretations. It may mean an extremal part which is not the top, bottom, front, or back (e.g., the sides of a car). This may be indicated by introducing (-prominent) as a companion marker to (+prominent). (-prominent) is interpreted as specifying an axis perpendicular to the (+prominent) axis. We then have as a reading for "side",

$side_2$(X): ((ex prt(X)) (-vert) (-prominent))

I suspect that the same variations produced by further qualification by (normal) hold as in the case of "front", but the distinctions become so fine here that they are hard to check on an informal basis.

Next, "side" may be taken to indicate any of the actually vertical sides, as for example, the south, west, north, and east sides of a building. This is easily defined as $side_3$:

((ex prt (X)) (-vert)).

This definition works for figures such as squares, hexagons, circles, and oblongs, but not for stars or ellipses. The feeling of inapplicability increases as the ellipsis becomes more elongated. This discrepancy may be eliminated by adding the restriction that the side not be zero dimensional (a point).
We now have:

$side_3$(X): ((ex prt (X)) ((-vert), (not (0 space))))

Finally, "side" may mean any side. This is just the concept (ex prt (X)) restricted not to be a point:

$side_4$(X): ((ex prt (X)) ((not(0 space)))

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In this sense, a front, back, right, left, top, or bottom surface or edge may be a side (e. g., the six sides of a cube)*

It is not clear to me how the readings for "front end", "front side", "top end", and "top side", arise. These expressions might themselves have lexical entries. They might be transformationally derived by a nominalizing transformation from structures corresponding to phrases such as "end at the front", etc. However, there is some question as to how well this transformational analysis works. "Corner store" means the same as "store at the corner", so that the first expression may arise transformationally from some structure corresponding to the second. But this relation fails for "corner car" and "car at the corner"; and "machine cat" and "cat at the machine."

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*One may wonder why (not (0 space)) is used for $side_3(X)$ and $side_4(X)$, but for $side_1(X)$ and $side_2(X)$. The decision was made on the consideration of examples such as the following. Consider a "star face" such as a child might draw:
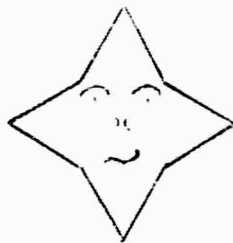
It seems to me that the two lateral points of such a figure are correctly referred to as sides in the sense of $side_2(X)$ (the sense of "side" which contrasts with front and back), but not in the sense of $side_3(X)$ (any vertical side). However, such examples might be debated at length; and if I should turn out to be wrong, the necessary adjustments would be very easy to make.

Thirdly, "front" may be an adjectival modifier of "end" in
"front end". On either of the last two suggestions, it is not
at all clear that the derived reading for "front end", as amal-
gamated from the meanings of "front" and "end", will have just
the form I have given above; though one would hope that such de-
rived readings and the reading suggested here would be equivalent
in practice.

"FRONT" AND "TOP" ADJECTIVES

When we refer to the top button, the top picture, or the top
iron-thing, there is a presupposition in each case that there is
more than one thing of the kind specified. There is an oddity
in using any of these expressions if there is only one button,
one picture, or one thing made out of iron in view, or admitted
by the linguistic context. For example, there is something very
wrong about the instruction "Push the top button on the board
which has only one button".

Furthermore, something is presupposed about the configura-
tion of the set of objects tacitly referred to by these expressions.
If the set of buttons relevant to the context does not constitute
a configuration which can be interpreted as having a top, the
instruction, "Push the top button", cannot be interpreted. This
would be the case for a horizontally oriented straight row of
buttons.

Thus far, the adjectival reading for "front" in "front X"
is seen to include as a presupposition that there be more than
one X forming a configuration which as a top, and that X con-
stitute the top of the configuration. Exactly analogous state-
ments hold for "front".

However, complications are r t at an end. In the case of
several, parallel vertical rows of buttons the phrase "the top
button" has no application. But "a top button" does.   It means

on at least one interpretation, any one of the buttons in the
top row. It may also mean any one of the buttons in any one of
the top few rows (if there are enough rows). This second inter-
pretation is not preferred, but can be brought out more clearly
in the case of "front". Consider a movie theatre (theatre A)
whose seats are divided by aisles into three sections or tiers.
Theatre B has only one tier of seats. A man going to the theatre
and having forgotten his glasses at home tells his friends he
wants to sit in a front row. In the case of theatre A, he may
mean he wants to sit in the first row of one of the three tiers.
But if he is headed for theatre B, he means one of the first few
rows.

These examples show that "top X" is not always a specific X
which forms the top of the presupposed configuration, but may be
a part or a member of a subconfiguration of X's which forms the
top of the main configuration. Such an analysis will also work
for "the top buttons". This phrase refers to a set, Y, of buttons.
It is presupposed that there is a set, X, of buttons, that the
configuration of Y forms the top of the configuration of X.
"Some top buttons" refers to a subset Z of Y, where Z has more
than one member.

Let $P(X)$ represent the defining property of X, and let
$conf(U)$ stand for the configuration of the members of any collec-
tion U. Then the meaning of "top X" can be given as

    (a)   Presupposition $(\exists Z) \ ((\forall z) \ (z \epsilon Z \Rightarrow P(z)))$

                                  $(\exists Y) \ (Y \subseteq Z)$

                                  $conf(Y) = $ the $top_i(conf(Z))$

    (b)   Defining property of X: $X \subseteq Y$.

There are two definitions for "top X"; one for $i=1$ and the
other for $i=2$.

The determiner attached to the phrase "top X" further speci-

fies whether X=Y, whether X is a subset of Y with more than one
member, whether X is a unit set of a single member of Y, or the
unit set of the unique member of Y.

"Front X", "back X", and "bottom X" are defined analogously,
by simply substituting the appropriate functions for $top_1(X)$.

USE OF "TOP", "FRONT", AND "SIDE" IN LOCATIVE PREPOSITIONS

In their strictly locative use, "before", "behind", "in front
of",* "in back of", "beside", "by", "above", "over", "on top of",
"below", "beneath", and "under" each describes a spatial relation
between objects, figures, or spatial locations. Such a spatial
relation R(X,Y) can be analyzed, in part, in terms of parts, or
sub-figures of Y, namely Y's front, back, top, bottom and sides.
These can be picked out using the functions and predicates previ-
ously defined. I will limit myself to listing the relevant func-
tions and predicates together with a few remarks on the distinc-
tions they make possible, and will not attempt to give the details
of definitions of the prepositions themselves.

(1) "above", "over", "on top of", "below", "under", and "beneath":
X is above Y if X is located in a volume the base of which is,
roughly speaking, identical with the top_2 of Y. For example, the
lamp above a desk is located higher up in perceptual space than
the uppermost side of the desk. Examples of this sort show that
$top_2(X)$ and $bottom_2(X)$ are the relevant functions for these pre-
positions. $top_1(X)$ and $bottom_1(X)$ do not seem to enter in at all.

(2) "before", and "in front of". "in front of the car" is am-
biguous: Aside from any special context it means located in front
of the front fender of the car. But imagine a photographer who

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*I am assuming that prepositional expressions such as "in front
of" arise from a single formative.

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stands fifteen feet away from the side of the car and asks his
child to stand in front of the car to have his picture taken.
The request is correctly fulfilled by standing before the side of
the car which the photographer is facing. This is just the side
specified by $front_p(X)$. On the first interpretation, the correct
side is given by $front(X)$.

We already noted that a brick or bottle does not have a
front. Yet something can be in front of a bottle or in front of
a brick; in each case the relevant side is the one facing the
speaker or relevant observer. This is just the side singled out
by $front_p(X)$, with clause (2) operative in the definition of
(+prominent). In the same way a ball does not have a front, but
something can be in front of or cross in front of a moving ball.
Again, the relevant side is selected by $front_p(X)$, this time with
clause (1) of the definition of (+prominent) involved.

These observations show that there are two definitions of
"in front of", one corresponding to a normal front side, the
other corresponding to a "front" picked out by the context. It
is likely that the two definitions will be identical, except that
one will use $front_p(X)$ where the other used $front(X)$.

It should also be noted that for an object, X, with a real
front, Y can be in front of X and at the same time above or below
X. For example, a flower can be said to be in front of a camera
which is posed directly above it to take its picture. Or a star
at the zenith can be in front of a telescope which is pointed at
it. This is "in front of" defined with $front(X)$. Nothing can
be in front of X in the sense using $front_p(X)$ and at the same
time be situated above or below X. This is because $front_p(X)$
does not refer to the front of normal orientation, which, because
it is singled out as a front in normal context, can actually be
horizontal in a special context. $front_p(X)$ refers to a side
singled out ' the immediate context and this is restricted to be

vertical in fact.   And, indeed, when "in front of" can only be
interpreted in the sense using $front_p(X)$ as in "in front of the
bottle" or "in front of the brick" nothing can be both in front
of the thing (e.g., bottle or brick) and at the same time above
or below it.

The same arguments can be made for "before".

(3) "behind" and "in back of" - Exactly analoguous to (2).

(4) "beside" and "by": "Beside" and "by" are also ambiguous:
the tree by or beside the house can be a tree in front of, behind,
on the right side of, or on the left side of the house. But if
John is said to sit by or beside Mary, usually he is not sitting
in front of her or behind her. If I talk about a car by or be-
side my car, I am usually taken to mean a car which is not before
or behind mine. Furthermore, the more restricted meaning of
beside may contrast with the front and back sides (the right and
left side of a liquor bar are also its ends) or may contrast with
the ends, whether or not the ends are distinguished between front
and back. Examples are, "By or beside the car" interpreted as on
the left or right side of the car; and "By or beside the rope".

These distinctions can all be made using the predicates
defined earlier:

$side_1(X)$: an (ex prt (X)) has the property $side_1(X)$ if it
is a vertical side and not an end.

$side_2(X)$: an (ex prt (X)) has the property $side_2(X)$ if it
is a vertical side which is not the front or back.

$side_3(X)$: an (ex prt (X)) has the property $side_3(X)$ just
in case it is a vertical side.

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13 ABSTRACT This article presents some discussion, criticism, and extension of Manfred Bierwisch's recent paper, "Some Semantic Universals of German Adjectivals" (1). Bierwisch draws conclusions about the structure of semantic theory as the result of his attempt to analyze the meaning of selected words and expressions. Correspondingly, the present paper will separate into two parts: (1) an extension of Bierwisch's study of semantic theory, and (2) further analysis of particular expressions. In Part I, I will present certain difficulties that arise from Bierwisch's restructuring of semantic theory, along with suggestions for dealing with these difficulties. In Part II, I will present the analysis of some words and expressions related to those that Bierwisch has examined. My analysis will use many of the semantic markers he has proposed as well as others that I have found necessary to add. These examples are further evidence of the usefulness of the semantic markers Bierwisch introduced.

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